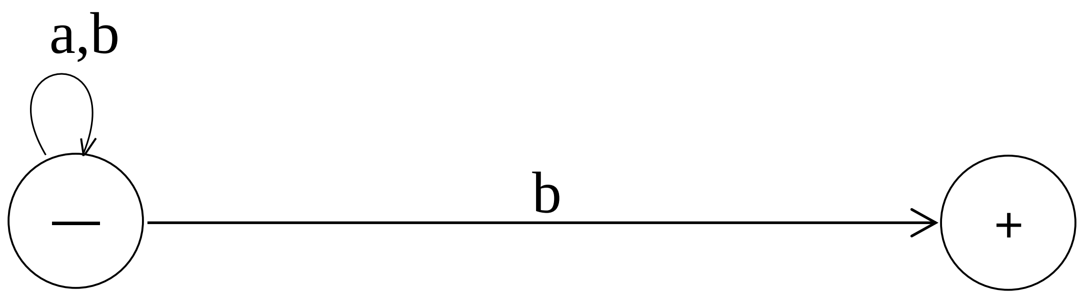
Recap lecture 8

- **TG definition, Examples:accepting all strings, accepting none, starting with b, not ending in b, containing aa, containing aa or bb**

Task Solution

- Build a TG accepting the language L of strings, defined over Σ={a, b}, **ending in b.**
- **Solution** The language L may be expressed by RE $(a + b)^*b$, may be accepted by the following TG



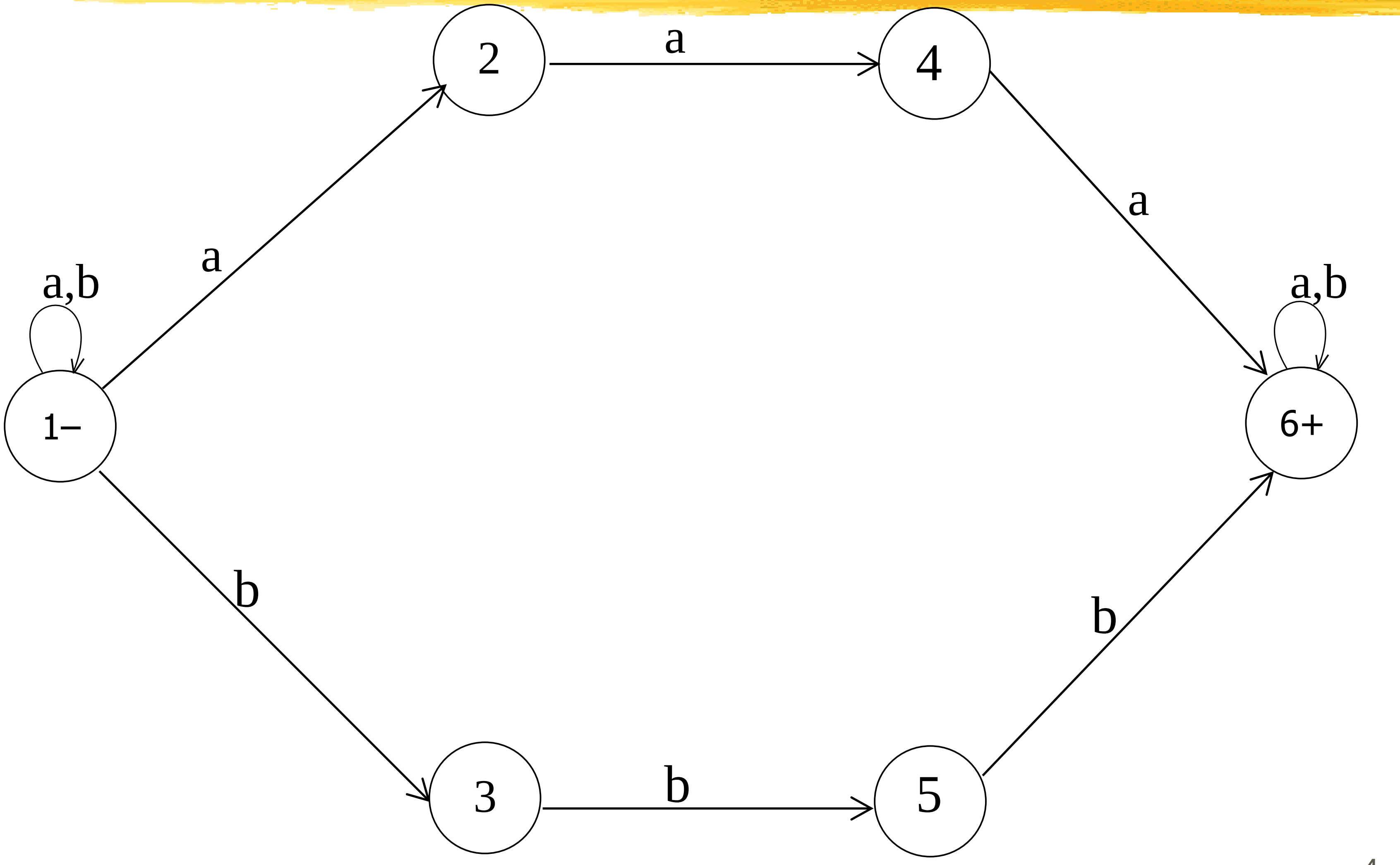
Example

Consider the language L of strings, defined over $\Sigma=\{a, b\}$, **having triple a or triple b.** The language L may be expressed by RE

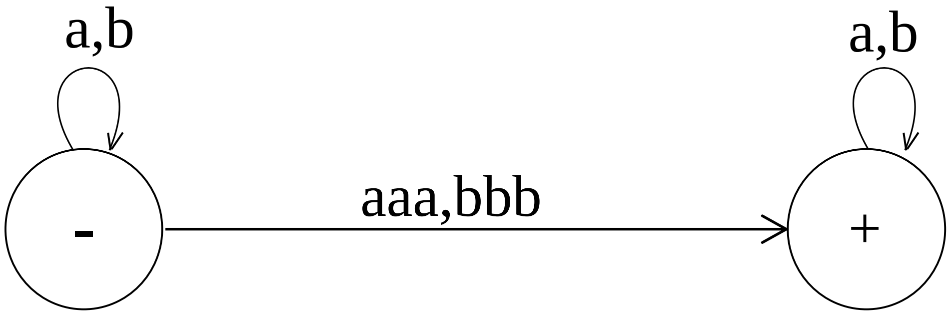
$$(a+b)^* (aaa + bbb) (a+b)^*$$

This language may be accepted by the following TG

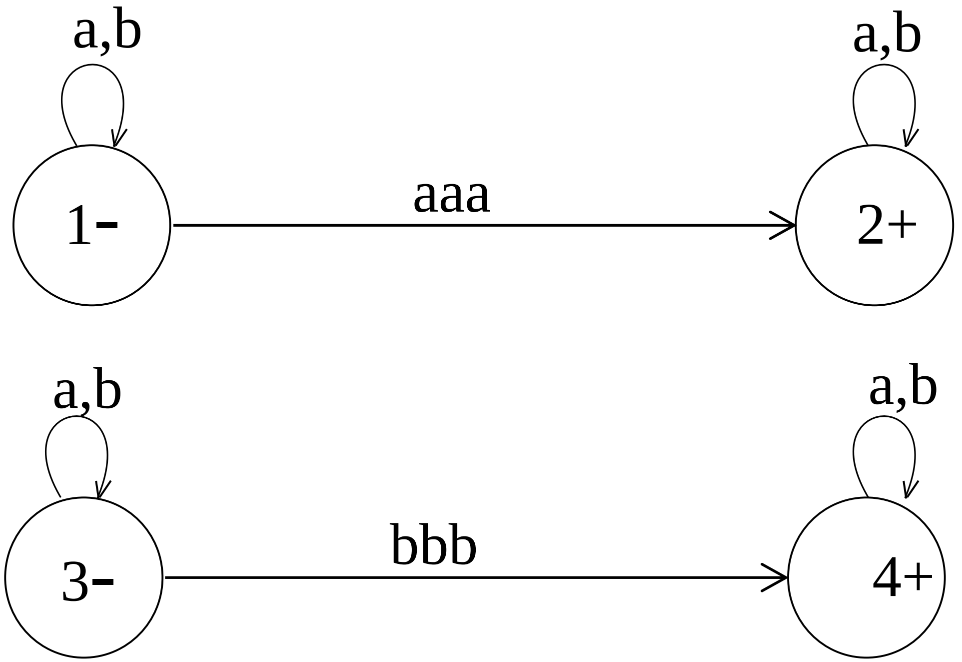
Example Continued ...



OR



OR



Example

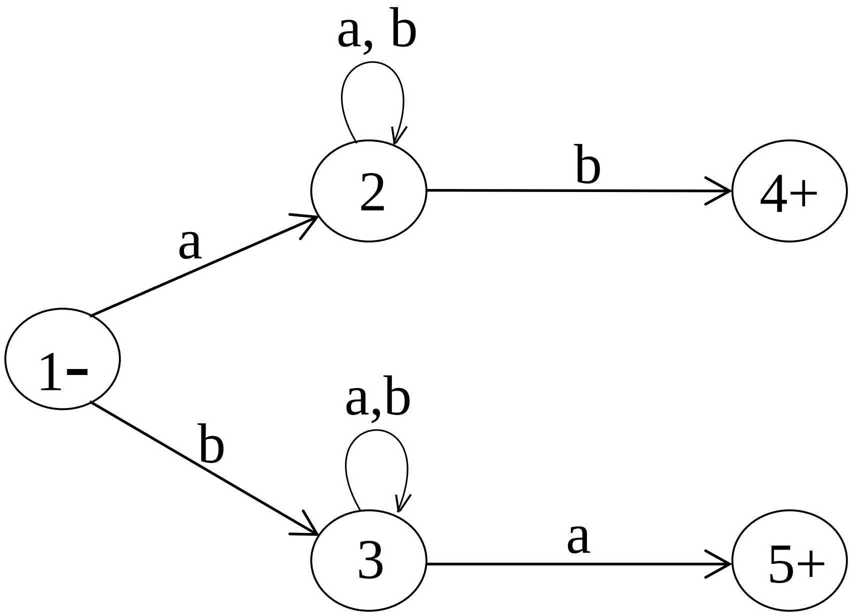
Consider the language L of strings, defined over $\Sigma = \{a, b\}$, **beginning and ending in different letters**.

The language L may be expressed by RE

$a(a + b)^* b + b(a + b)^* a$

The language L may be accepted by the following TG

Example continued ...



Example

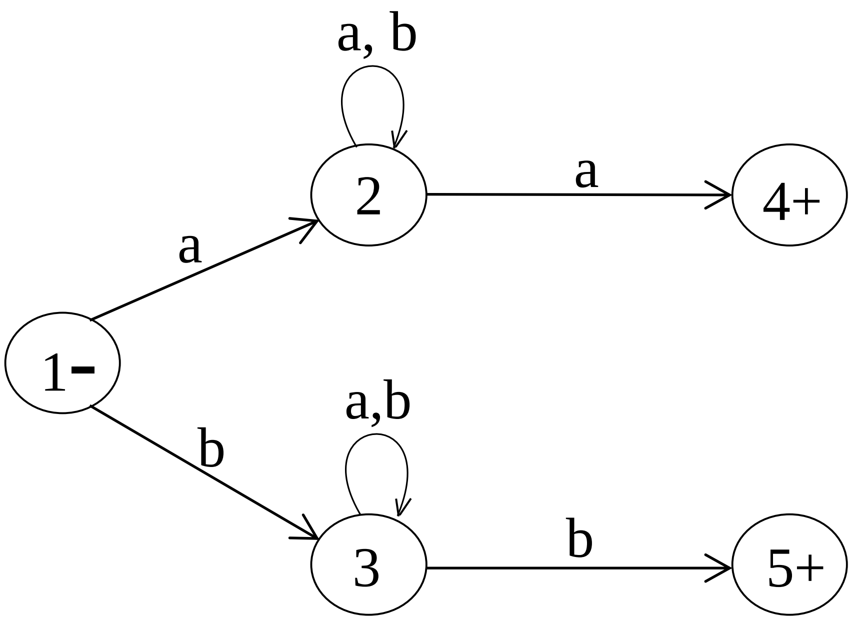
- Consider the Language L of strings **of length two or more**, defined over $\Sigma = \{a, b\}$, **beginning with and ending in same letters.**

  The language L may be expressed by the following regular expression

  $$a(a + b)^{*}a + b(a + b)^{*}b$$

  This language may be accepted by the following TG

Example Continued ...



Task

Build a TG accepting the language L of strings, defined over $\Sigma=\{a, b\}$, **beginning with and ending in the same letters.**

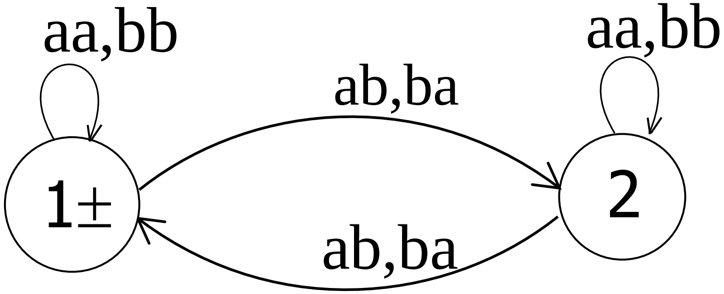
Example

- Consider the **EVEN-EVEN** language, defined over Σ={a, b}. As discussed earlier that **EVEN-EVEN** language can be expressed by a regular expression

  $$(aa+bb+(ab+ba)(aa+bb)^*(ab+ba))^*$$

  The language **EVEN-EVEN** may be accepted by the following TG

Example continued …



Example

- Consider the language L, defined over $\Sigma=\{a, b\}$, in which **a's occur only in even clumps and that ends in three or more b's**. The language L can be expressed by its regular expression

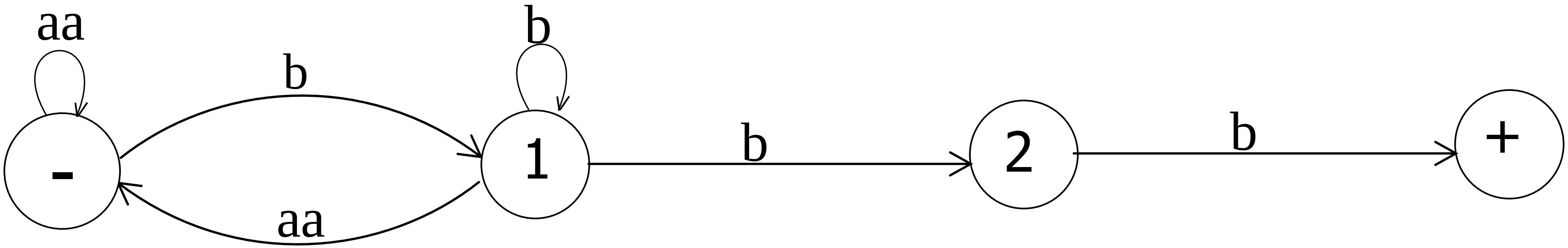
  $$(aa)^*b(b^*+(aa(aa)^*b)^*)\ bb$$

  OR

  $$(aa)^*b(b^*+(\ (aa)^+b)^*)\ bb$$

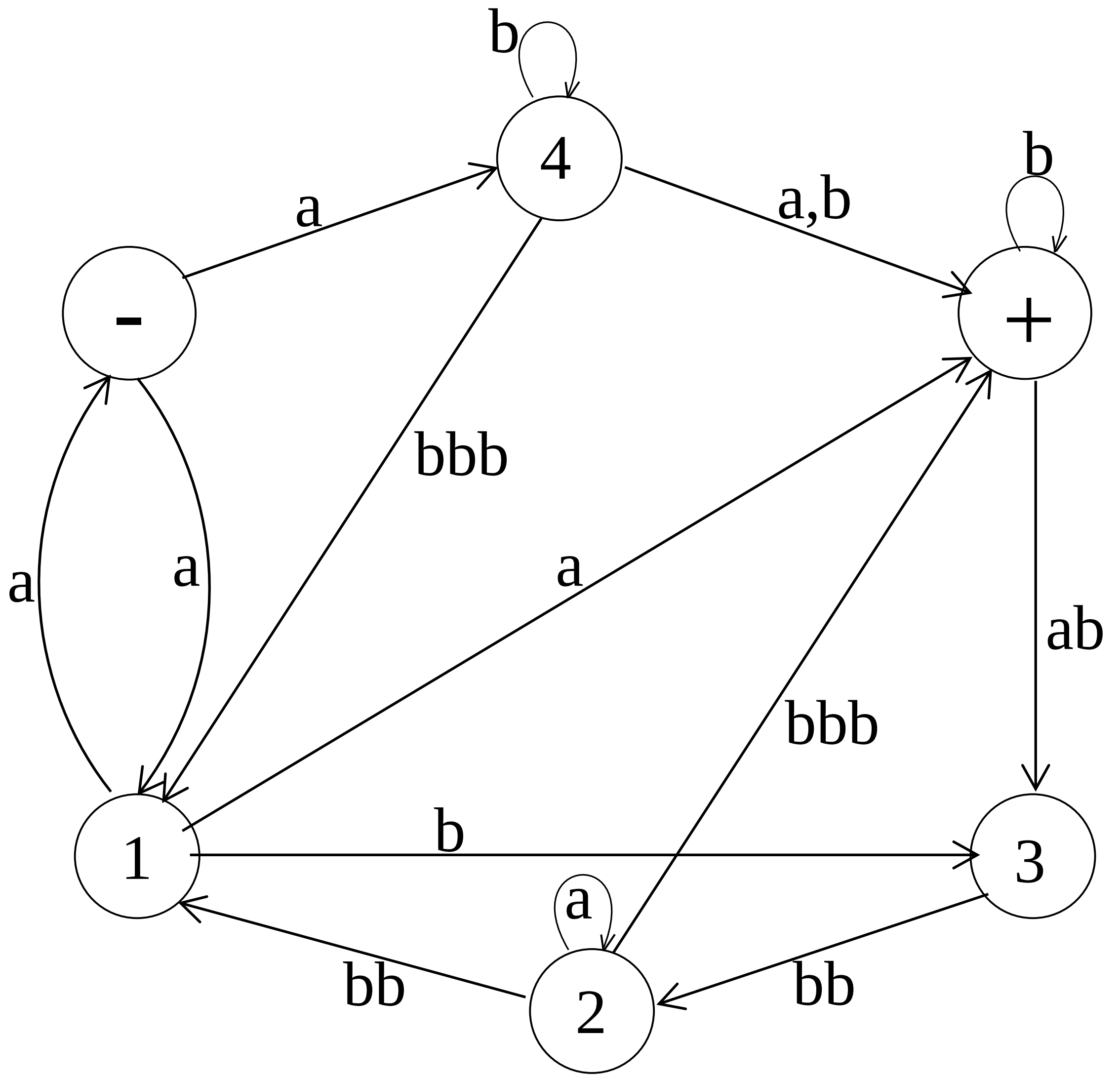
  The language L may be accepted by the following TG

Example Continued ...



Example:

Consider the following TG



Example Continued …

- Consider the string abbbabbbabba. It may be observed that the above string traces the following three paths, (using the states)

1) (a)(b) (b) (b) (ab) (bb) (a) (bb) (a)
   (-)(4)(4)(+)(+)(3)(2)(2)(1)(+)
2) (a)(b) ((b)(b)) (ab) (bb) (a) (bb) (a)
   (-)(4)(+)(+)(+)(3)(2)(2)(1)(+)
3) (a) ((b) (b)) (b) (ab) (bb) (a) (bb) (a)
   (-) (4)(4)(4)(+) (3)(2)(2)(1)(+)

Example Continued …

Which shows that all these paths are successful, (*i.e.* the path starting from an initial state and ending in a final state).

Hence the string abbbabbbabba is accepted by the given TG.

Generalized Transition Graphs

A generalized transition graph (GTG) is a collection of three things

1) Finite number of states, at least one of which is start state and some (maybe none) final states.
2) Finite set of input letters (Σ) from which input strings are formed.
3) Directed edges connecting some pair of states labeled with regular expression.

It may be noted that in GTG, the labels of transition edges are corresponding regular expressions

Summing Up

- **TGs accepting the languages: containing aaa or bbb, beginning and ending in different letters, beginning and ending in same letters, EVEN-EVEN, a's occur in even clumps and ends in three or more b's, example showing different paths traced by one string, Definition of GTG**